Homework Set 4: Centers of Mass

1. Point-masses $m_i$ are located on the x-axis as shown. Find the moment $M$ of the system about the origin and the center of mass $\bar{x}$.

\[
\begin{array}{ccc}
  m_1 = 31 & m_2 = 5 & m_3 = 17 \\
  -2 & 0 & 3 & 7
\end{array}
\]

For questions 2 and 3, the masses $m_i$ are located at the points $P_i$. Find the moments $M_x$ and $M_y$ and the center of mass of the system.

2. $m_1 = 1$, $m_2 = 5$, and $m_3 = 8$; $P_1(-1,1), P_2(1,-3)$, and $P_3(2,2)$

3. $m_1 = 10$, $m_2 = 5$, $m_3 = 4$, and $m_4 = 7$; $P_1(1,-2), P_2(3,4), P_3(-4,5)$, and $P_4(6,-1)$
4. Calculate the moments $M_x$ and $M_y$ and the centroid of the given shape where $\rho = 2$.

For questions 5 through 8, sketch the region bounded by the curves, and visually estimate the location of the centroid. Then find the exact coordinates of the centroid.

5. $2x + 3y = 12, \ y = 0, \ x = 0$
6. \( y = 2 - x^2, \ y = 0 \)

7. \( y = x, \ y = x^2 \)

8. \( y = 1/x, \ y = x^2, \ x = 2 \)